

# A Multi-Media, Computer-Based, Self-Directed, Autonomous, Stress and Anxiety-Management Countermeasure

Completed Technology Project (2008 - 2012)



## Project Introduction

1. Original Project aims/objectives: Stress and anxiety-related problems are some of the most common and costly behavioral health problems in society. For those working in operational environments (i.e., astronauts, flight controllers, military), stress and anxiety-related problems before, during, or after missions can seriously compromise efficiency, safety, and performance. To address behavioral health issues like stress, it is important to maximize the privacy, validity, and acceptability of the countermeasures used. Our project had two specific aims: 1) to develop an evidence-based, autonomous, multimedia program to train users to manage stress and build resilience; 2) to evaluate the program in a randomized controlled trial (RCT). The program is called SMART-OP (Stress Management and Resilience Training for Optimal Performance). The six-session cognitive-behavioral therapy (CBT)-based program includes education about stress, and interactive training exercises that teach users to monitor stress, regulate emotions and relax, think flexibly, be realistic, and take effective action to deal with stressors. The content of the program can be modified to target different populations who work in challenging environments (e.g., astronauts, military, and flight controllers) and could be disseminated widely via computer, tablet, or smartphone.

2. Key Findings: We recently evaluated SMART-OP in an RCT with a sample of stressed but otherwise healthy University of California, Los Angeles (UCLA) Law and Business School students (N=66). SMART-OP was compared to an attention control (AC) group that received marketed stress management information (i.e., videos and reading material). Interested participants were screened to ensure they met study eligibility criteria (no medical or psychiatric conditions, were stressed based on a self-report stress score, and a UCLA graduate student). Two hundred and thirty individuals expressed interest in the study, 169 were screened, and 80 were eligible. Participants (N = 66) were randomized to SMART-OP or AC and were evaluated on self-report measures and performance on The Trier Social Stress Test (TSST). Participants also evaluated the program for usefulness and usability. Fifty-nine participants completed all training sessions and assessments. The SMART-OP group reported significantly less stress, more perceived control over stress, and rated the program as significantly more useful than the AC group. During the TSST, the SMART-OP group showed a more adaptive within-task recovery at post-assessment based on a-amylase data (a biomarker of stress). SMART-OP received an excellent score on a measure of usability.

3. Impact of key findings on hypotheses, technology requirements, objectives, and specific aims of the original proposal: Our RCT key findings indicate that SMART-OP is highly usable and is a more effective and useful stress management training program than an educational comparison. These findings support our initial hypotheses that the self-guided interactive multimedia stress management and resilience training program would be a useful and acceptable method of training to the user, and an effective stress management countermeasure. Our findings are consistent with the growing



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literature on technology-based behavioral health interventions which report that such programs are effective and acceptable forms of treatment. SMART-OP only requires a computer for use so it can be used confidentially at a time and place of the user's choosing. The program can also be modified for use by nearly any population as well as tablet or smartphone platforms. We also met our two main aims and objectives of our original proposal-- to develop an evidence-based autonomous, multimedia stress management training program and to evaluate it in an RCT. SMART-OP is designed to train people who work in operational environments like space flight and military to build resilience and mental fitness to stress. The stressors faced by individuals who work in such settings are often chronic in nature (e.g., training demands, family concerns, and conflicts at work) and they often do not receive specific training on effective ways to address such stressors, or may be reluctant to ask for help due to stigma. Our research led us to create a confidential, valid, and effective form of evidence-based stress management training using interactive multimedia technology. SMART-OP was designed with the concept that if an individual is handling life stress well, then they can better focus on their job, perform optimally, and lead a more satisfying life.

4. Proposed research plan for the coming year: This concludes our project. Our plan is to continue our research and revise and update the program based on our finding from this RCT and evaluate it with a sample of individuals who work in operational settings (e.g., flight controllers at Johnson Space Center-JSC or military personnel).

## Anticipated Benefits

Stress Management and Resilience Training for Optimal Performance (SMART-OP), is a computer-based, self-guided multimedia, interactive, evidence-based stress management and resilience training program. As this study concludes, we not only have developed an evidence-based stress management and resilience training countermeasure with potential value to the space program and other operational environments (e.g., Military), but also with some modifications and revisions, to the broader American public. Stress-related health problems, and work-related stress and burnout are among the most common and costly health problems in the country. Stress also plays a significant etiological role in the onset of many physical and psychiatric disorders. The "Stress Diathesis Model" posits that stress in conjunction with a biological predisposition is responsible for the onset of many psychiatric problems like anxiety and depression. Additionally a program like SMART-OP that delivers effective, confidential, and acceptable evidence-based behavioral health care can also address barriers to care, such as limited availability of clinicians trained in evidenced-based interventions, or patient reluctance to attend clinical settings due to stigma. As far as we know, this program is the first of its kind to deliver self-guided, multimedia, evidence-based stress management training. Now that our initial randomized controlled trial on

## Organizational Responsibility

### Responsible Mission Directorate:

Space Operations Mission Directorate (SOMD)

### Lead Organization:

National Space Biomedical Research Institute (NSBRI)

### Responsible Program:

Human Spaceflight Capabilities

## Project Management

### Program Director:

David K Baumann

### Principal Investigator:

Raphael D Rose

### Co-Investigators:

Michelle Craske  
Jay C Buckey  
Gary E Beven  
Dorie (dorothy) Glover

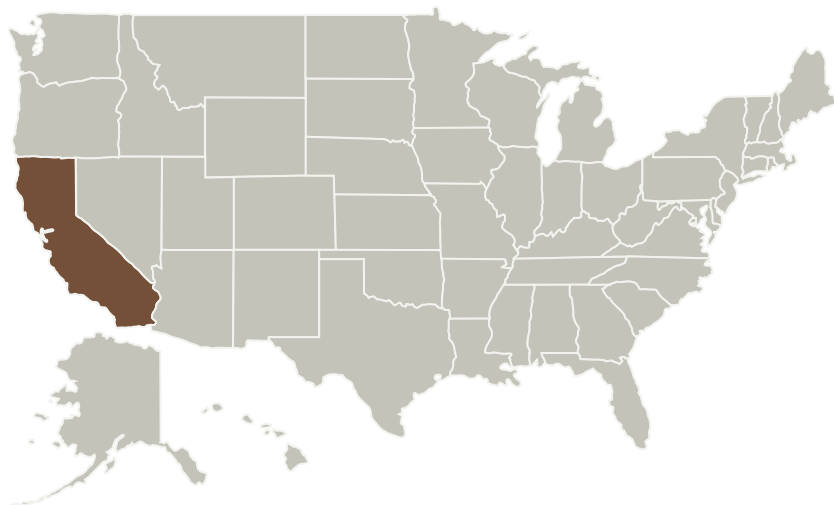
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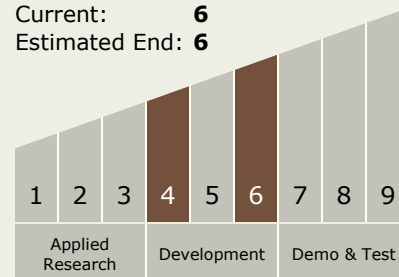
SMART-OP is complete and there is data to support its efficacy, usefulness, and acceptability, a potential next step would be larger-scale effectiveness studies to further identify in which sub-populations (e.g., military or flight controllers) and which settings (e.g., home, clinic), and which method of delivery (e.g., tablet or smartphone) are effective. Ultimately, SMART-OP may help to prevent mental and medical problems in the future by providing easy access to evidence-based stress management skills that help build resilience and mental fitness, and help mitigate the onset of mental health and medical disorders. SMART-OP has the potential for widespread dissemination via computer, tablet, or smartphone to provide evidence-based stress-management training to individuals worldwide. Stress is a common and costly behavioral health issue. Nobody is immune from facing stressful situations occasionally yet few people receive any stress management training. SMART-OP delivers confidential, evidence-based stress management training to the user in a novel and engaging format that only requires a computer and can be used at a place and time of their choosing. The potential educational benefit for a program like SMART-OP is immense and can serve as an important example of the type of work NASA research supports that can impact the day-to-day lives of people on Earth.

## Primary U.S. Work Locations and Key Partners



## Technology Maturity (TRL)

Start: **4**  
Current: **6**  
Estimated End: **6**



## Technology Areas

### Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - └ TX06.3 Human Health and Performance
    - └ TX06.3.2 Prevention and Countermeasures

## Target Destinations

The Moon, Mars

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Organizations Performing Work	Role	Type	Location
National Space Biomedical Research Institute(NSBRI)	Lead Organization	Industry	Houston, Texas
Dartmouth College	Supporting Organization	Academia	Hanover, New Hampshire
University of Southern California(USC)	Supporting Organization	Academia	Los Angeles, California

## Primary U.S. Work Locations

California

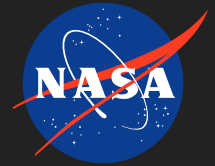
## Project Transitions

**July 2008:** Project Start**June 2012:** Closed out

**Closeout Summary:** Summary: SMART-OP (Stress Management and Resilience Training for Optimal Performance) is a self-guided, multimedia, interactive, computer-based, stress management and resilience training program based on evidenced-based cognitive-behavioral principles. During the last year of the project, we completed a randomized controlled trial (RCT) with a sample of stressed but otherwise healthy individuals at the University of California, Los Angeles (UCLA). Participants (N = 66) were randomized to SMART-OP or an attention control (AC) group given marketed videos and published material on stress management. Participants were evaluated on self-report measures and performance on the Trier Social Stress Test (TSST). Participants also evaluated the program for usefulness and usability. The main findings indicated that the SMART-OP group reported significantly less stress, more perceived control over stress, rated the program as significantly more useful than the AC group, and rated it "excellent" in usability. During the TSST, the SMART-OP group showed a more adaptive with in-task recovery at post-assessment based on a-amylase data (a biomarker of stress). Randomized Controlled Trial: A total of 230 individuals expressed interest in the study, 169 were screened, and 80 were eligible (no medical or psychiatric diagnoses but stressed based on self-report). Sixty-six participants completed the pre-assessment lab task and were randomized to one of the two conditions, and 59 participants completed all training sessions and assessments. Training sessions were conducted weekly and lasted approximately 30-45 minutes each. Each pre- and post-assessment lasted 2 hours during which participants completed self-report questionnaires; performed tasks (i.e., gave a speech, solved arithmetic questions) while connected to psychophysiological monitoring equipment which recorded heart rate, respiration, and skin conductance levels; and we collected saliva samples for biomarker analyses. Each assessment required a team of 3 research assistants. Nearly 350 training sessions and 125 assessments were conducted by a mainly volunteer research team. Data Analyses: Collected data was entered and cleaned by our research staff. Over 1700 variables of data were created. Numerous statistical analyses examining several hypotheses as well as several exploratory analyses were conducted and findings interpreted. Manuscript Preparation: A manuscript covering the development of the SMART-OP program, and a description of the RCT rationale, procedures, results, and implications was written. The manuscript was submitted to a peer-reviewed journal for publication. Program Revisions: Based on data from the RCT we made some revisions to the program and videotaped additional footage to be included in a future version of the program. Presentations: Several presentations were made at International conferences describing the program and RCT findings.

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## Stories

Abstracts for Journals and Proceedings  
(<https://techport.nasa.gov/file/63979>)

Articles in Peer-reviewed Journals  
(<https://techport.nasa.gov/file/63982>)

Articles in Peer-reviewed Journals  
(<https://techport.nasa.gov/file/63977>)

Articles in Peer-reviewed Journals  
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Books/Book Chapters  
(<https://techport.nasa.gov/file/63976>)

Books/Book Chapters  
(<https://techport.nasa.gov/file/63986>)

## Project Website:

<https://taskbook.nasaprs.com>